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A simple sol-gel route for the preparation of silica-surfactant mesostructured materials. M Ogawa, Chem. Commun., 1996, 1149-1150.

Primary Examiner—Paul Marcantoni
Attorney, Agent, or Firm—Paul W. Zimmerman

[57]

ABSTRACT

This invention pertains to surfactant-templated nanometer-scale porosity of a silica precursor solution and forming a mesoporous material by first forming the silica precursor solution into a preform having a high surface area to volume ratio, then rapid drying or evaporating a solvent from the silica precursor solution. The mesoporous material may be in any geometric form, but is preferably in the form of a film, fiber, powder or combinations thereof. The rapid drying or evaporation of solvent from the solution is accomplished by layer thinning, for example spin casting, liquid drawing, and liquid spraying respectively. Production of a film is by layer thinning, wherein a layer of the silica precursor solution is formed on a surface followed by removal of an amount of the silica precursor solution and leaving a geometrically thinner layer of the silica precursor solution from which the solvent quickly escapes via evaporation. Layer thinning may be by any method including but not limited to squeegeeing and/or spin casting. In powder formation by spray drying, the same conditions of fast drying exists as in spin-casting (as well as in fiber spinning) because of the high surface-area to volume ratio of the product. When a powder is produced by liquid spraying, the particles or micro-bubbles within the powder are hollow spheres with walls composed of mesoporous silica. Mesoporous fiber formation starts with a similar silica precursor solution but with an added prepolymer making a pituitous mixture that is drawn into a thin strand from which solvent is evaporated leaving the mesoporous fiber(s).